

INTERLANGUAGE



AMERICAN ESPERANTO MAGAZINE

TECHNICAL
VOCABULARIES
IN ESPERANTO

A Critical Study
and Survey

by

W. Solzbacher, Ph.D.

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AMERIKA ESPERANTISTO

Vol. 63

SPECIAL EDITION

Nos. 7-8

TECHNICAL VOCABULARIES IN ESPERANTO

FACTS, PROBLEMS, AND SUGGESTIONS

WILLIAM SOLZBACHER, PH.D.

More and more it is coming to be understood how fundamental the faults and limitations of communication are to the ills of human society. Misunderstanding and lack of understanding breed fears and hostilities in even small and intimate groups. Conversely, good understanding based upon intelligible communication is the first step toward cooperation. The basic difficulties and limitations of communication have only recently been recognized. The perfecting of mechanical means of communication — telephone, telegraph, transportation — far outruns our progress in the essential means of communication. These are first of all *the construction, utilization and translation of languages*. Thus far the most universal language is that of mathematics. Some approach to universality is made in physics and chemistry and in the more abstract branches of biology. But these abstract languages are common to but an infinitesimal portion of mankind....

CHESTER I. BARNARD,
President of the *Rockefeller Foundation*,
in "A Review for 1948", pp. 22-23.

Esperanto was devised as a simple but effective bridge across the gulf of misunderstanding. As early as 1921, thirty-nine members of the French Academy of Sciences called the Interlanguage "a masterpiece of logic and simplicity" and urged its large scale use in science and technology. In their statement the French scholars, who included three Nobel Prize winners in the fields of physics and medicine (Prince de Broglie, Jean Perrin, and Charles Richet),

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emphasized the need for elaborating adequate Esperanto vocabularies for all branches of science.

The advice of these scholars has not remained unheeded. Considerable headway has been made both in the practical use of Esperanto in all fields of human knowledge and endeavor and in the arduous work of perfecting the terminological tools for the application of the Interlanguage in an ever increasing number of specialized areas.

It is hardly possible to over-estimate the tremendous scope of this endeavor. Biology deals with more than a million names of plants and animals, electrical engineering with an estimated 40,000 technical terms, chemistry with more than 25,000 compounds. The Illustrated Technological Dictionaries (ITW), prepared under the direction of Alfred Schlomann, total 16,000 pages and contain 96,000 technical terms in each of 6 languages (German, English, French, Russian, Italian, Spanish). In spite of their wide scope, they are far from complete even in the limited field covered. A complete Esperanto translation of the Schlomann dictionaries would be not more than a partial solution of the problem. In principle, the DVTWV organization decided in 1923 to add Esperanto to the languages used in the Schlomann dictionaries; financial difficulties, however, up to the present time, have prevented this decision from being carried out.

A specialist who wishes to write an essay in Esperanto on nuclear fission, the cure of poliomyelitis, the spectrum of Sirius, or the rules of baseball, will find a number of helpful books which he may consult on questions of terminology. There are no infallible dictionaries, however, in which he can look up the English word and be sure to find the Esperanto equivalent listed in the next column. The writer needs a minimum of linguistic experience to do his job well, and in some cases he may be the first to use a certain technical term in Esperanto. His work will be, at least in part, the effort of a pioneer.

How "International" are Technical Terms?

It is often claimed that scientific and technical terms are by nature international. If this were completely true, the question of the Esperanto vocabulary would be very simple. In fact, however, the statement is true for a considerable majority of words, but not for all of them. The field of technical terms international in appearance, but not in substance, is full of pitfalls for amateur and expert alike.

Let us take, for instance, the words "billion", "trillion", "quadrillion", etc. They are "international", but do not even mean the same in the British and the American branches of the English language. In New York and in Paris, a billion is a thousand millions. In London, Berlin, Stockholm, Moscow, Rome, and Buenos Aires, it is a million millions. In Esperanto, the word has been used by various authors in either meaning.

There is also a widespread belief that the Latin names in botany and zoology are in every case precise and explicit. Unfortunately, such is not the case. According to an essay by Hans Jakob in the UEA (Universal Esperanto Association) Year Book for 1937, one species of European sea eagle is known under the following names: *Falco albicilla*, *Falco pygargus*, *Falco ossifragus*, *Falco albicaudus*, *Falco hinnularius*, *Falco melanaetus*, *Vultur albicilla*, *Aquila haliaetos*, *Aquila albicilla*, *Aquila ossifraga*, *Haliaetus albicilla*, *Haliaetus nisus*, *Haliaetus islandicus*, *Haliaetus orientalis*, *Haliaetus borealis*, *Haliaetus Brooki*. It's the same bird every time, if you please, and the list of its Latin names is not even complete. What are we going to call this animal in Esperanto — or in any language, for that matter — as long as our learned colleagues, the ornithologists, have not made up their minds?

Similarly, the Latin of the pharmacists seems to have an "Eastern" and a "Western" dialect, the one used in Germany, Switzerland, Russia, etc., the other in the United States, England, France, the Netherlands, and South Africa.

What is *Sulphur ferrosium crystallisatum* in one dialect is *Ferrum sulphuricum oxydulatum* in the other. According to *E. Wuester*, seven different Latin names are in use for the dehydrate of ethyl alcohol.

In his article, "An Interlanguage for Science" (*American Esperanto Magazine*, May-August, 1947), *Professor Mario A. Pei*, of Columbia University, pointed out that "where English uses the suffix *-ide* for a certain chemical compound (*chloride, sulphide, iodide*), Italian uses *-uro* (*cloruro, solfuro, ioduro*)". Similarly, *E. Wuester* mentions that German *Eisenchlorid* is *perchlorure de fer* in French, *Eisenchloruer* is *protoclorure de fer* while the French *chlorure de fer* has as wide a meaning as to cover both *Eisenchlorid* and *Eisenchloruer*.

Although mathematical figures and formulas are supposed to be the most universal language now in existence, they are not always unambiguous. What in America is written 12,394.56 becomes 12.394,56 in France, and 12 394,56 in Germany.

These examples show that the problem of technical vocabularies in Esperanto is closely related to that of the international standardization of terminologies. Such outstanding specialists as *Professor A. Cotton* (of the French Academy of Sciences), *E. Drezen* (of the Commission on Technological Terminologies in the Academy of Sciences of the Soviet Union), and *Dr. E. Wuester* (of the German Committee on Standards) have proposed the use of Esperanto as a "code" language for the international standardization of technical terminologies.

It has been repeatedly suggested that the *American Esperanto Magazine* publish a survey of what has been achieved so far in the field of technical vocabularies as well as a critical study on what remains to be done. It was felt that it would be useful to have such an essay in English since many of the points at issue are likely to be of interest not only to those who are using Esperanto now in their

own fields of specialization or are planning to do so in future, but also to many others who recognize the importance of close international cooperation in science, technology, culture, and education.

A Record of Achievement in Esperanto

Few people inside and outside the Esperanto movement have a clear idea of the enormous amount of work already completed in the preparation and publication of technical vocabularies in Esperanto. More than one hundred of them have appeared in print, ranging from Electrical Engineering to Pharmacology, from Philosophy to Bull Fighting, from Architecture to the Fur Trade, and from Ornithology to Naval Artillery. Millions of working hours of highly qualified specialists have gone into the writing and editing of these vocabularies. In almost every field of human knowledge and endeavor, at least a solid beginning has been made. In some fields, most of the work has been completed. In others, preparations have reached or are approaching the half-way mark.

In attempting to draw up as complete a bibliography as possible, I discovered soon enough that it was necessary to narrow down my original plan because the list would have exceeded 200, perhaps even 300 numbers. On the other hand, a list of the major works only would not have given a fair picture of the variety of fields covered so far. The line had to be drawn somewhere, and I arrived at a list of 106 publications, printed in 19 different countries, covering 43 specialized fields. If, somewhat arbitrarily, vocabularies of at least 75 printed pages are classified as "major" publications, you will find 32 of them listed: 5 of more than 300 pages each, 8 of 200—300, 12 of 100—200, and 7 of 75—100 pages.

Of the 106 vocabularies on our list, 39 were published in France, 16 in England, 16 in Germany, 6 in Japan, 5 in Russia, 3 each in Switzerland, Belgium, and Italy, 2 each in

the Netherlands, Austria, Czechoslovakia, and Poland, 1 each in Argentina, Brazil, Spain, Denmark, Sweden, Norway, and Finland. Some give definitions in Esperanto only, others contain translations in Latin, English, French, Spanish, German, Russian, Portuguese, Italian, Dutch, Danish, Swedish, Norwegian, Finnish, Czech, Polish, or Japanese.

As a starting point for this list, *the most complete and up-to-date published anywhere so far*, I used the excellent article by *Hans Jakob, Faka-Sciencia-Teknika Vortaro, Resumo Bibliografia*, published in 1937. Of the 70 publications listed by Jakob, I omitted 15, because they did not fit into my somewhat narrower definition of "technical vocabularies". I added 17 new publications, which have appeared since 1937, and 34 older ones which Jakob had disregarded or overlooked.

All the larger Esperanto dictionaries contain a considerable number of technical terms. *Millidge* is particularly good on plant and animal names; *Wuester* on engineering, mathematics, chemistry, and biology; *Grosjean-Maupin* on law and mathematics; *Filip* on plants, animals, minerals, philosophy, and religion; *Boirac* on philosophy, medicine, and law; *Tellini* on biology, chemistry, and medicine. The *Plena Vortaro* (*Grosjean-Maupin, Esselin, Grenkamp-Kornfeld, Waringhien*) covers considerable ground in almost all fields, especially political science, sociology, law, philosophy, chemistry, biology, and medicine.

Business and commercial terms as well as technical terms from the fields of travel, transportation, and international relations are included to an ever increasing extent in all major Esperanto dictionaries, which is, of course, exactly as it should be.

Certain books of specialized topics, although not dictionaries or terminologies in form and appearance, are goldmines of terminological information, especially in the fields of medicine, chemistry, meteorology, transportation, and international law. A few examples worth mentioning are:

the excellent Esperanto translation of International Agreements on Railroad Passenger and Freight Traffic, issued by J. Rebiček, Czechoslovakia, in 1930, in a 254-page volume; the Esperanto translations of the Constitutions of various countries, including the United States; and the Brazilian Government's impressive 315-page volume, *Statistika Resumo pri Brazilo*.

Technical vocabularies covering such fields as geometry, horticulture, mining, and explosives, are ready, or almost ready, in manuscript form. According to E. Wuester, the translation of about half of the Schlomann dictionary on the Construction and Operation of Railroads (an 884-page volume) has been completed. The 1945 UEA Year Book contained an announcement that "more than 10 new technical vocabularies" were in preparation for publication in future editions of the Year Book.

"Authoritative" and "Experimental" Vocabularies

Existing technical vocabularies in Esperanto differ greatly, not only in plan, size, completeness, and typographical presentation, but also in the degree of authority which they may claim in their respective fields. Some of them have been adopted by organizations of recognized standing; others are of a purely experimental character having been elaborated by a person or a group of persons without official mandate. Some have been carefully checked and revised with the help of experts from all parts of the world; others are still in need of this kind of revision.

The International Electrotechnical Vocabulary is an example of a terminology of the most authoritative type. Published by the International Electrotechnical Commission, which has been working on the international standardization of terms since 1906, its Esperanto terminology is about as "perfect" as a vocabulary can be. It may have to be revised from time to time to keep pace with progress in electrical engineering. It may be expanded to include terms not

yet covered. But the basis is solid, and engineers are accustomed to keep discipline and accept fixed standards.

The Vocabulary of Illumination enjoys a somewhat lesser authority since it was prepared not under the auspices of the International Commission on Illumination, but of a Dutch body cooperating with it. Its authors, however, have closely followed the International Commission's work in the field of standardization of terminology and have consulted experts outside their own country.

The *Medical Dictionary* owes its authoritative standing to other factors. Its principal author, *Dr Briquet*, was able to draw upon a large number of medical publications in Esperanto as well as on such books as *D. Bouchard's Anatomical Dictionary* (with contributors in France, England, Germany, Russia, Belgium, Spain, etc.) and several pharmacological vocabularies. A first draft of the *Medicina Vortaro* was published in serialized form over a period of several years, in the *Internacia Medicina Revuo*, and comments and criticism were invited. Only after the critical remarks were all in and a number of changes and additions had been made was the dictionary brought out in book form.

Matters developed differently in the field of chemistry. As early as 1912, a nomenclature of inorganic and organic chemistry was agreed upon by a group of specialists in the International Association for Esperanto in Science (ISAE), and printed in Paris. Fourteen years later, a much more detailed *Leksikono de Kemio kaj Farmacio* was published in Tokyo. It used the ISAE nomenclature as one of its basic materials, but made a number of changes. Another twelve years later, in 1948, the *Racia kaj Internacia Kemia Nomenklatur*o by *Curt Dellian* was published in Munich. It is in many respects more complete and up-to-date than anything published previously. Apparently, however, it was prepared without reference to either the Paris or the Tokyo publication, and was written at a time when Germany was greatly isolated from the outside world.

"International" and "Rational" Terminologies

When Dr. L. L. Zamenhof published the *Fundamento de Esperanto*, he listed only 1,800 word roots in his vocabulary (*Universala Vortaro*) but included in his 16 rules of grammar the famous Rule Fifteen: "International words, i.e. words which a majority of languages take from the same linguistic source, undergo no change in the international language, beyond conforming to its spelling. If several words are formed from the same root, it is better to use only the basic word unchanged and to form the other words in conformity with the rules of Esperanto."

This means that all genuinely international words are automatically part of Esperanto whether or not they are listed in dictionaries: *telefono*, *geografio*, *katalogo*, *elektrotekniko*, *radiotelegrafio*, *atombombo*, *streptomikeno*, *poliomielito*, *pentekosto*, *astrofiziko*, *kleptomanio*, *akumulatoro*, *televido*, etc. Taking into account the innumerable fields of specialization in human knowledge and endeavor, there are hundreds of thousands of such words. *Rule 15 of the Fundamento is the principal basis of all technical vocabularies in Esperanto.*

Trouble arises, however, in cases where "international" words do not mean the same in all countries (as pointed out at the beginning of this study) as well as when there are several "international" words having the same meaning. There are many more "international" words than are needed. The choice between them has to be made not on the basis of "right or wrong" but rather on the basis of "good" and "not so good".

When Dr. Briquet's Medical Dictionary was published, one reviewer criticized it for containing two words for "navel": *umbiliko* and *omfalo*. Since *umbiliko* is official and perfectly satisfactory, there should be no need for *omfalo*, he claimed. So far, so good. But when it comes to derivations, the matter becomes somewhat more complicated. An American obstetrician expressing himself in Es-

peranto is likely to call the umbilical chord *umbilika ŝnuro*, but will talk at the same time about such things as *omfaloragio*, *omfalotripsio*, and *akromfalo*. It would not be hard to substitute for these terms words formed from *umbiliko*, but in that case the terminology would differ greatly from the one the doctor uses in his own language.

Perhaps the word *pneŭmonio* (for pneumonia) is an even better example. Its internationality is not as great as some people believe. English, French, Spanish (with the spelling *neumonia*), and Portuguese, are about the only languages using it currently. Italians say *polmonite*, Germans *Lungenentzündung*, Russians *vospalyenie lyogkikh*. Most languages use the equivalent of "inflammation of the lungs". In medical terminology, Esperanto uses the suffix *-ito* to indicate "inflammation of", so that *bronkito* means bronchitis, *pulmito* pneumonia. This means that there is no real need for *pneŭmonio* although it is to a certain extent "international".

In English, an eye-doctor may be called an oculist (from the Latin *oculus*) or an ophthalmologist (from the Greek *ophthalmos*). Medical terminology contains some words derived from *oculus* and an even larger number derived from *ophthalmos*. Should Esperanto stick to derivations from *okulo* or follow English and French in their wasteful use of both a Latin and a Greek root in this and many other cases? The strongest demand for word economy has been coming from scholars in the Far East, especially Japan.

Many highly qualified persons have expressed a belief that such problems must be solved gradually rather than all at once. A dictionary must in the first place *register usage as it is*, whether or not certain terms please the editor. If two terms for the same thing are in actual use, both must be listed. In the second place, however, a dictionary should *guide the user*. This means that, when two words are listed, the dictionary should state *whenever feasible* which one should be preferred.

In some cases, this is rather simple. Take, for instance, the word *cefalalgio*, meaning "cephalalgia", a sixty-four-dollar word for "headache". It is as superfluous in Esperanto as it is in English since *headache* and *kapdoloro* adequately express its meaning. Therefore, in my opinion, a medical dictionary should state under *cefalalgio* that *kapdoloro* is preferable. Under *bekzakanta* it should state that *sesboka* is better. I doubt, however, whether it would be wise at the present time to make a similar statement about *umbiliko* and *omfalo*, *pulmito* and *pneŭmonio*. It may be better to leave this question open and postpone decision until more experience has been gained.

In chemistry as well, a choice has sometimes to be made between two kinds of "international" words. Should mercury be *hidrargo* or *merkuro*, tungsten *volframo* or *tungsteno*, antimony *stibio* or *antimono*? *Merkuro*, *tungsteno* and *antimono* have a much greater degree of internationality in our modern languages, but *hidrargo*, *volframo* and *stibio* correspond to the Latin names on which the symbols of these elements (*Hg*, *W*, and *Sb*) are based. As long as chemists have to memorize these symbols and the artificial Latin words for which they stand, they might just as well also learn the Esperanto terms *hidrargo*, *volframo*, and *stibio*. It would be a help, though, if the chemists of the world would find a way of changing *Hg*, *W*, and *Sb*, to *Me*, *Tu*, and *At*, or something similar.

The fact that in several branches of science a need is felt for revising the traditional terminology or nomenclature, because of obvious shortcomings, has led the authors of some Esperanto vocabularies to suggest "rational" terms differing from those in the most important European languages. *Dellian*, for instance, proposes the word *fano* for what is commonly called cyclohexane. He demonstrates that this has considerable advantages. *Duncan*, in his review, objected to *Dellian*'s approach, stating that "internationality is often more important than severe rationality".

It is logical that Esperanto publications should keep pace with any progress made in the field of standardization and rationalization of scientific nomenclature. It is not without danger, however, if some Esperanto publications try to run ahead of progress, claiming for Esperanto a pioneer role which goes beyond reasonable possibilities, thus throwing Esperanto terminology out of line with scientific nomenclature in general, whatever its shortcomings may be.

On the other hand, if changes such as those proposed by Dellian are presented not for immediate general use in Esperanto, but on a purely experimental basis, so as to test their advantages and possible disadvantages in comparison with the traditional nomenclature, the results of such tests may be of real value to science.

The Publishers of Technical Vocabularies

Much more than the plans of authors and editors, the modalities of publication have been responsible for the particular characteristics of existing books. Some have been sponsored by trade or professional organizations or by various institutions of learning, e.g. the International Electrotechnical Commission, the International Pharmaceutical Federation, the Dutch Institute of Illumination, the Brazilian Government Institute of Geography and Statistics, the Zoological Museum of the Russian Academy of Sciences, the International Trade Fair of Frankfurt (Germany), Waseda University (Tokyo). In other cases, Esperanto organizations or periodicals were the publishers: the Universal Esperanto Association, *Internacia Medicina Revuo*, the Swedish Esperanto Federation, etc. Profits were not expected, but publication costs and risks had to be fitted into the budgets of the organizations concerned.

In other cases commercial publishers, such as Hachette & Co., Paris, and Hirt & Sohn, Leipzig, brought out Esperanto dictionaries on anatomy, navigation, technology, music, mathematics, etc. Since the printing of such books is ex-

pensive and sales are usually slow, it may be assumed that the firms concerned were interested more in prestige than in direct financial gain, counting on increased profits from other Esperanto books to cover a possible loss on publications which had a direct appeal to specialists only.

Vocabularies in a third group were published by the authors themselves, or their friends, with or without subsidies from interested organizations.

In almost every case, authors and editors have had to abbreviate or otherwise change their copy to meet restrictive budgetary requirements. E. Wuester's *Maŝinfaka Vortaro*, for instance, a masterpiece of planning and thoroughness, suffers from over-condensation. Its first part contains a combined systematic and alphabetical list of Esperanto terms followed by two figures each, one in bold type, indicating the page, the other in ordinary type, the line on which the German translation may be found. The second part contains German words with similar page and line references to the Esperanto part. This ingenious system, combined with the choice of a very small but remarkably clear type, has enabled the author to cram an amazing amount of information into only 89 pages. As a matter of fact, Wuester handles more word material in this space than Dr. Briquet does on the 359 pages of his *Medical Dictionary*. But Wuester's system is a tremendous drain on the user's time. For persons who do not know German, the book requires, in addition, the use of a German dictionary. The idea of practical engineers making their translations by alternate dips into two or more books, hunting page and line numbers all the time, is unrealistic. They will rather pay a few dollars more for a book designed for quick orientation. It would not be difficult to transform Wuester's excellent dictionary of *Machine Elements* into a book containing translations in English, French, Spanish, and Russian, as well as German, with practical indices for each language. In such a revised form, however, the same word material would require a volume

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of at least 400 pages, and the publisher's investment would be correspondingly higher.

In Japan many pharmacists and students of pharmacology have learned Esperanto in order to be able to use the authoritative *Seslingva Vortareto de Medikamentoj* published by the *Hermesa Rondeto* in 1930. It lists the names of drugs in Esperanto, Latin, Japanese, German, English, and French, following the alphabetical order of the Esperanto names.

The even more authoritative *Rapport de la Commission de la Nomenclature Pharmaceutique*, published in 1922 by the International Pharmaceutical Federation, gives the names of drugs in Esperanto and Latin, thus making it possible to use either one as a "code" for comparing terms in various languages. The book is based on 16 national pharmacopoeias. The Esperanto words in the Vocabulary of the International Electrotechnical Commission may be used in a similar manner.

Some Esperanto vocabularies, though giving an excellent condensation of the terminology of the field concerned, are of much less practical use because information has to be "dug out" at considerable cost in time and effort.

The greatest obstacle to an increased practical use of Esperanto vocabularies is the fact that many of them are out of print. Books of this kind sell slowly, but they keep selling year after year. When enough years have gone by, even a large printing will be sold out. This would normally be the time for bringing out revised editions, but publishing costs have gone up everywhere, and few publishers are willing at present to invest capital that may be recovered only over a long period of time.

In the present situation, therefore, the problem consists not only in the need to continue the work of establishing complete terminologies or nomenclatures in all fields of knowledge and endeavor, but also in making the results of past endeavors available to new users.

A Research and Publishing Center

Many recent developments point to the conclusion that the time is ripe for the application of Esperanto in science, technology and other fields on a much larger scale than heretofore. A tremendous step forward could be made if it were possible to establish an International Center of Coordination and Publication which would prepare and publish a series of model vocabularies in a format designed for ready use. In cooperation with the Esperanto Academy, the International Association for Esperanto in Science, the authors of existing books, and the best experts that can be found in all parts of the world, such a center would analyze and screen past publications and use them as a basis for its own books.

In most of these high quality dictionaries, it would be desirable to include a systematical part, with illustrations and charts where needed, an alphabetical Esperanto part with translations in a number of languages, and alphabetical indices for each language used. Translations should be given in at least three languages, with English and French as an absolute minimum, and Spanish, German, and Russian whenever feasible. Other languages such as Latin, Portuguese, Dutch, Chinese, Japanese, Arabic, etc., could be added where previous publications and the personnel of the co-workers make this possible or advisable. The books could be arranged in such a way that they would be helpful not only for those using Esperanto, but even for others who may be in need of translations say from Russian to Spanish, from German to English, or from French to Japanese, in their specialized field.

The cost of the research would be negligible in comparison to the results obtainable. The task of bringing the terminology or nomenclature of some branch of science or other field of knowledge or endeavor into systematic order has always attracted and fascinated men of ability and experience. In the past, they have given freely of their time

and labor without seeking financial reward. They will undoubtedly continue to do so.

Editing, checking, and revising, and especially publishing, would require larger investments. But if the books were well edited and printed, and designed for practical use, sales would bring back a large part of this investment, though perhaps only over a period of years.

With conditions in the world as they are now, when it is almost impossible to transfer money from certain countries to other countries and when the sale of books outside the country of publication is subject to enormous difficulties, a publishing center for technical vocabularies of this kind could not make profits nor remain in existence without subsidies. But the results that can be obtained are so great that the funds required would be very modest in comparison.

Here is a great opportunity for some philanthropic foundation with vision and foresight. The publication of a series of high quality international dictionaries for science, technology, and various fields of human endeavor, using Esperanto as a medium of unification and standardization, as a "measuring rod" or "code," would constitute a great contribution to the cause of worldwide understanding and cooperation.

Professor Björn Collinder, internationally famous linguist of Uppsala University, Sweden, declared: "Mankind has reached a point where it is faced with the necessity of accepting two evils at the same time: In the first place, the study of languages consumes an unreasonably large proportion of the time of scientists and scholars; secondly, science is in danger of losing its worldwide universality, which for centuries has been its very essence." The same scholar, however, pointed out the answer to the dilemma: "*If someone asks me how the world language problem should be solved, my answer is: It is solved already in Esperanto. The problem now is only to get the solution accepted by those in power.*"

TECHNICAL DICTIONARIES IN ESPERANTO

A BIBLIOGRAPHICAL SURVEY

Actuaries (Insurance Mathematicians)

Dictionnaire Actuariel, Dr. E. Sós. Brussels, 1931. Esperanto-German-English-French.

Anatomy

Anatomia Vortaro Kvarlingva, Ch. Bouchard. Paris, 1906, 80 pp. Latin-French-English-Esperanto.

Architecture

Universala Terminologio de la Arkitekturo, Fr. Azorín. Madrid, 1933, 215 pp. & 2,000 illustrations. Esperanto-English-French-German-Spanish-Italian-Portuguese.

Army

Armea Terminaro, E. D. Durrant. Rickmansworth, England, 1940, 27 pp. with illustrations.

Automotive Engineering

Priskribo de bendo pneŭmatika kaj akcesoroj, H. Sešdef. Geneva, 1909, 4 pp.

Aviation

Lexique Aéronautique, R. d'Armon. Paris, 1913, 212 pp. English-French-German-Spanish-Italian-Esperanto.

Aeronaŭtika Terminaro, E. D. Durrant. Rickmansworth, 1941, 36 pp. with illustrations.

Aeronaŭtika Terminaro, E. D. Durrant & Fred Turner. Stockholm, 1948, 4 pp. Swedish-Esperanto.

Provo de Vortareto por Aeronaŭtiko, M. Finot. Geneva, 1909, 2 pp.

Botany

Botanika Klasifiko, A. L. Malmanche. Rueil-Malmaison, 1935, 92 pp.

Bull Fighting

Teknika Leksikono de Toromakio, L. Carles. Paris, 1909, 50 pp.

Chemistry (see also Pharmacology)

Racia kaj Internacia Kemia Nomenklatur, C. Dellian. Munich, 1948, 36 pp.

TECHNICAL DICTIONARIES

- Esperanta Nomenklature de Kemio*, Internacia Scienca Asocio Esperantista. Paris, 1912, 15 pp.
- Provo de Kemia Nomigado*, P. Berthelot. Paris, 1909, 16 pp.
- Projekto de Kemia Nomaro Esperanta*, Th. Renard & R. Van Melckebecke. Paris, 1904, 4 pp.
- Neorganika Kemio*, Amiko, Paris, 1904, 3 pp.
- Koloidkemio Terminaro*, T. Maeda. Tokyo, 1929, 28 pp. Esperanto-English-German-French.

Children's Games

- Terminaro por Infanludoj*, Society of British Esperanto Teachers. Rickmansworth, 1942, 28 pp. with illustrations.

Commerce

- Komerca Vortaro en Esperanto*, R. Kreuz & A. Mazzolini. S. Vito, Italy, 1927, 104 pp.
- Komerca Vortaro Seslingva*, R. Kreuz. Frankfurt, 1927, 146 pp. German-English-French-Italian-Spanish-Esperanto.
- Common Commercial Terms in English & Esperanto*. Welwyn, England, 1926, 16 pp.
- Nederlandsch-Esperanto Handelstermen*, J. Eiselin. Antwerp, 1925, 100 pp. Dutch-Esperanto.
- Esperanto-Finna Alfabeto Registro de Komercaĵoj*. Tampereella, 1922. Esperanto-Finnish.
- Vortaro de Komercaĵoj*, R. Kreuz & M. Urban. Frankfurt, 1921, 12 pp. Esperanto-German.
- Varolisto en Esperanto*, R. Kreuz & O. Schutkowski. Frankfurt, 1927, 44 pp. Esperanto-German-French-English-Spanish-Italian.
- Provizora Listo de Plej Ofte Uzataj Komercaj Vortoj*, Bobin, Cart, Lajarte, Page, & Butin. Paris, 1925, 8 pp.

Education

- Terminaro Pedagogia kaj Psikologia*, P. Bennemann. Dresden, 1934. Esperanto-German-English-French.
- Teknika Vortareto de Pedagogio, Logiko kaj Psikologio*, P. Trarbach. Cologne, 1925, 14 pp. Esperanto-German-French-English.

Electrical Engineering (see also Illumination, Radio)

- International Electrotechnical Vocabulary*, International Electrotechnical Commission. London, 1938, 311 pp. French-English-German-Italian-Spanish-Esperanto; index for each language.

BIBLIOGRAPHICAL SURVEY

Vocabulario Electrotécnico Internacional, IEC. Buenos Aires, 1939, 302 pp. Spanish-French-English-German-Italian-Esperanto.

Mejdunarodnij Elektrotekničeskij Slovarj, IEC. Leningrad-Moscow, 1936, 376 pp. French-Russian-English-German-Italian-Spanish-Esperanto.

International Electrotechnical Vocabulary, Fundamental Definitions, IEC. London, 1935, 63 pp. French-English-German-Italian-Spanish-Esperanto.

Elektroteknika Vortaro, Waseda University. Tokyo, 1933, 73 pp. English-Esperanto-Japanese.

Elektrotechnische Ausdruecke in Esperanto, E. Wuester. Berlin, 1923, 4 pp. German-Esperanto.

Fur Trade

Faka Vortareto. Terminoj uzataj en komerco pri peltoj. London, 1921, 4 pp.

Illumination

Benamingen op het Gebied der Verlichtingskunde. Arnhem, 1941, 154 pp., with charts & illustrations. Dutch-German-English-French-Esperanto; with indexes for each language.

Glueblampen & Bogenlampen, W. Velten. Berlin, 1907, 40 pp. German-Esperanto.

Law

Leĝa Terminaro, Dr. A. Mildwurf. Rickmansworth, 1946, 12 pp.

Juristisches Woerterbuch Deutsch-Esperanto, Dr. S. Liebeck. Berlin, 1932, 86 pp. German-Esperanto.

Machine Elements (see also Technology)

Maŝinfaka Esperanto-Vortaro Prielementa, E. Wuester. Leipzig, 1923, 89 pp. Esperanto-German & German-Esperanto.

Mathematics

Matematika Terminaro, R. Bricard. Paris, 1905, 60 pp.

Matematika Vortareto, Ceretti. Leghorn, 1903.

Vortaro de Matematiko, ISAE. Paris, 1913.

Medical Science (see also Anatomy, Pharmacology)

Esperanta Teknika Medicina Vortaro, Dr. M. Briquet. Brussels, 1932, 360 pp. Definitions in Esperanto, translations in Latin and, when necessary, in English, French, German, Italian, Spanish.

TECHNICAL DICTIONARIES

Medicina Vortaro, Iji-Ŝinbun. Tokyo, 1928. Japanese-Esperanto-Latin-German.

Mechanics

Elementoj de Vortaro de Mekaniko, ISAE. Paris, 1914.

Provo de Vortoj por Mekaniko, L. Saint-Loup. Paris, 1904, 2 pp.

Menus

Manĝokarto, I. Tejchfeld. Warsaw, 1911, 4 pp. Esperanto-English-French-German-Polish-Russian.

Music

Muzika Terminaro, M. C. Butler & F. Merrick. Rickmansworth, 1944, 36 pp. Definitions in Esperanto, with some translations in English, German, and French.

Muzika Terminaro, F. de Mênil. Paris, 1908, 10 pp.

Navigation

Provo de Marista Terminaro, Rollet de l'Isle. Paris, 1908, 78 pp. & many ill. Covers also: *Astronomy, Meteorology, Hydrography, Fishing, Naval Artillery*. Esperanto-English-German-French-Spanish-Italian-Dutch.

Ornithology

Ornitologia Vortaro Oklingva de Birdoj Eŭropaj, P. Stojan. St. Petersburg, 1912, 218 pp. Contains about 15,000 bird names. Prepared under auspices of Imperial Russian Academy of Sciences. Latin - English - French - German-Italian-Polish-Russian-Esperanto.

Pharmacology (see also Chemistry)

Poliglota Vade-Mecum de Internacia Farmacio, C. Rousseau. Paris, 1911, 288 pp. Latin-English-French-German-Spanish-Dutch-Italian-Russian-Swedish-Esperanto.

Nomenclature Pharmaceutique. Paris, 1922, 104 pp. Latin-Esperanto-French.

Seslingva Vortareto de Medikamentoj, Hermesa Rondeto. Tokyo, Japan, 1930, 208 pp. Esperanto-Latin-Japanese-German-English-French.

Leksikono de Kemio kaj Farmacio, Hermesa Rondeto. Tokyo, 1926, 196 pp. In 3 volumes: (1) *Kemia Terminaro kaj Nomenklatur*; (2) *Nomoj de Drogoj laŭ Botanika Klasifiko*; *Nomoj de Medikamentoj kaj Drogoj laŭ Japana Farmakopeo*; (3) *Nomoj de Drogoj kaj Kreskaĵoj*. Japanese-Esperanto.

Philately

- Filatela Terminaro*, H. M. Scott. Horrem bei Köln, 1928, 47 pp.
 Esperanto-English-French-German, with definitions in Esperanto.
- Vocabulaire Français-Esperanto de la Philatélie*, R. Lemaire. Paris, 1903, 21 pp. French-Esperanto.
- Alfabeta Tabelo de Filateliaj Fakesprimoj*. Hamburg, 1914, 12 pp.
 German-French-Spanish-Esperanto.
- Tausch-Code*, P. A. Artemjev. St. Petersburg, 1913, 61 pp. German-French-English-Russian-Esperanto.

Philosophy

- Filozofia Vortaro*, St. Kamaryt. Prague, 1934, 171 pp. Esperanto-English-Czech-French-German.

Photography

- Elementa Fotografa Optiko*, K. Verks. Paris, 1906, 79 pp. & 30 ill.
- Vocabulaire Français-Esperanto des Termes Photographiques*, Ch. Verax. Paris, 1907, 48 pp. French-Esperanto.

Physics (see also Mechanics, Electrical Engineering)

- Elementoj de Fizika Vortaro*, ISAE. Paris, 1913.

Phytopathology & Mycology

- Fitopatologia kaj Mikologia Terminaro*, P. Neergaard. Copenhagen, 1946. Esperanto-English-Danish.

Post Office & Telecommunications

- Poŝt-Telekomunika Vortaro*, R. Filliâtre. Paris, 1934.
- Le Traducteur de Poste International*, S. Gaertwagen. Cracow, 1923.

Psychology (see under Education)**Radio**

- Radio-Amatersky Slovník*, O. Ginz. Prague, 1927, 221 pp. Czech-Esperanto-German-French-English.
- Radio-Lexic*, G. Malgorn. Paris, 1925, 36 pp. French-English-German-Italian-Spanish-Esperanto.
- A Short Dictionary of Radio Terms*, H. Epton. London, 1925, 80 pp. Esperanto-English.
- English-Esperanto Radio Dictionary*, H. Epton. London, 1924, 5 pp. English-Esperanto.

TECHNICAL DICTIONARIES

- Radio-Vortaro*, P. Christaller. Berlin, 1924, 9 pp. Esperanto-German.
Radio-Terminaro, W. Schattat. Berlin, 1926, 4 pp. German-Esperanto.
Radio-Esperanto, G. Demidjuk. Moscow, 1926, 32 pp. Russian-Esperanto.
Norsk-Esperanto-Engelsk Radio-Ordbok, R. Bugge-Paulsen. Oslo, 1926. Norwegian-Esperanto-English.
Radiotechnisches Woerterbuch. Vienna, 1924. English-French-German-Spanish-Italian-Esperanto.
Radio-Terminaro, A. Venture. Rickmansworth, 1943, 34 pp.

Railroads

- Fervoja Terminaro*. Rickmansworth, 1939.
Eisenbahn-Woerterbuch, G. Habellok. Breslau, 1923, 49 pp. German-Esperanto.

Red Cross

- Esperanto et Croix-Rouge*, Lt. Bayol. Paris, 1906, 165 pp. French-Esperanto.
Esperanto und Rotes Kreuz, Lt. Bayol & L. Elb. Berlin, 1908, 230 pp. German-Esperanto.
Esperanto i Krasnij Krest, A. Ergolskij. Odessa, 1909, 178 pp. Russian-Esperanto.
Esperanto Guide to the Red Cross, Lt. Bayol & A. Adams. Paris, 1908, 16 pp. English-Esperanto.
Sputnik Krasnago Kresta, Lt. Bayol & G. Kolovrat. Paris, 1909, 16 pp. Russian-Esperanto.
Guia Esperanto de la Cruz Roja. Paris, 1909, 16 pp. Spanish-Esperanto.
Guia Esperanto da Cruz Vermelha, Paris, 1910, 16 pp. Portuguese-Esperanto.
Guida Esperanto della Croce Rossa. Paris, 1909, 16 pp. Italian-Esperanto.
Guide Esperanto de la Croix-Rouge. Paris, 1908, 16 pp. French-Esperanto.
Esperanto-Fuehrer fuer das Rote Kreuz. Paris, 1908, 16 pp. German-Esperanto.
Esperanto-Vejleder for det Rode Kors. Paris, 1909, 16 pp. Danish-Esperanto.

BIBLIOGRAPHICAL SURVEY

Esperanto-Parlör Röda Korsets. Paris, 1910, 16 pp. Swedish-Esperanto.

Woerterbuch fuer das Rote Kreuz, F. Uhlmann. Schussenried, 1913, 43 pp. German-Esperanto.

Religion

Religioj, Ordenoj kaj Sektoj. Provo de Internacilingva Nomigado kaj Difino, H. Jakob. Geneva, 1928, 14 pp.

Teknika Religia Vortaro, J. Bianchini, Paris, Reprinted from "Espero Katolika".

Cursus Completus Esperanti, J. Bianchini. S. Vito, 1934, 176 pp. Esperanto-Latin. (General dictionary, but with special emphasis on Catholic theological and liturgical terms).

Psikisma Terminaro. Antwerp. 1911. (Spiritualist).

Saws

Saegenwoerterbuch, H. J. Plehn. Vienna. English-German-French-Italian-Esperanto.

Science (General)

Tabelo da Vortoj Fakaj, Sciencaj kaj Teknikaj, P. Fruictier. Paris, 1904, 32 pp. Esperanto-English-French-German.

Enciklopedia Vortareto Esperanta, Ch. Verax. Paris, 1910, 264 pp. Esperanto-French.

Scienca Fundamenta Esperanta Terminaro, Rollet de l'Isle. Paris, 1931, 127 pp.

Sewing & Knitting

Kudra kaj Trika Terminaro, M. & V. Verda. Rickmansworth, 1947, 20 pp. & ill.

Statistics

Termos Estatísticos em Esperanto, Instituto Brasileiro de Geografia e Estatística. Rio de Janeiro, 1947. 6 pp. Portuguese-Esperanto.

Technology (see also Elec. Engineering, Machine Elements)

Vocabulaire Technique et Technologique, Ch. Verax. Paris, 1907, 138 pp. French-Esperanto.

Transportation (see also Aviation, Navigation, Railroads)

Code International Lugagne. Paris, 1914, 991 pp. French-English-Portuguese-Spanish-German-Italian-Esperanto.

TECHNICAL DICTIONARIES

Umbrellas, Manufacture of

Terminoj Uzataj en Fabrikado de Ombreloj. London, 1921, 4 pp.

Zoology

Provo de Esperanta Nomigado por la Zoologio, De Givry & Ch. Verax. Geneva, 1908, 5 pp.

BOOKS AND ARTICLES ON

THE SUBJECT OF THIS STUDY

PETRO STOJAN: *Bibliografio de Internacia Lingvo.* Geneva, 1929.

HANS JAKOB: *Faka-Sciencia-Teknika Vortaro. Resumo Bibliografia.* In "Jubilea Jarlibro de la Esperanto-Movado", pp. 159-170. Geneva, 1937.

EUGEN WUESTER: *Internationale Sprachnormung in der Technik.* Berlin, 1931. A Russian translation of this German book appeared in Moscow, 1935; a summarized German edition in Berlin, 1934.

EUGEN WUESTER: *Konturoj de la Lingvo-Normigo en la Tekniko.* Budapest, 1936.

EUGEN WUESTER: *Esperantologiaj Principoj.* In "Enciklopedia Vortaro", Leipzig, 1923-29.

ERNEST DREZEN: *Pri Problemo de Internaciigo de Science-Teknika Terminaro.* Moscow and Amsterdam, 1935.

Internacia Sciencia Revuo, Internacia Sciencia Gazeto, & Bulteno de ISAE. Paris, Geneva, & Horrem, 1903-1933.

Sciencia Revuo. Purmerend, Netherlands, 1949.

Esperantologio. Copenhagen, 1949.

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<i>Kemia Nomenklatur</i> o, <i>Racia kaj Internacia</i> , Dellian, printed by mimeograph, 1948, 36 pp.45
<i>Komerca Vortaro en Esperanto</i> , Kreuz & Mazzolini, fairly complete, 104 pp., bound edition50
<i>Kudra kaj Trika Terminaro</i> , M. & V. Verda, sewing and knitting dictionary, ill., 20 pp.30
<i>Leĝa Terminaro</i> , Dr. A. Mildwurf, special small edition of legal terms, 1946, 12 pp.30
<i>Lumigoscienco — Benamingen op het Gebied der Verlichtingskunde</i> , ill. & charts, Dutch-German-English-French-Esperanto, with indexes, 154 pp.	2.75
<i>Maŝinfaka Esperanto-Vortaro Prielementa</i> , Wuester, Esperanto, 86 pp.60
<i>Medicina Vortaro, Esperanta Teknika</i> , Dr. M. Briquet, definitions in Esperanto, also translation when necessary in English-French-German-Italian-Spanish, excel., 360 pp., cloth bound	2.75
<i>Muzika Terminaro</i> , Butler & Merrick, 1944, definitions in Esperanto, with some translations in English, German and French, 1944, 36 pp.30
<i>Pitopatologia kaj Mikologia Terminaro</i> , Neergaard, Esperanto-English-Danish, 1946	(to order)
<i>Radio-Terminaro</i> , A. Venture, with diagram of a typical radio receiver, 1943, 34 pp.30
<i>Rimvortaro, Kompleta Esperanta</i> , Jaumotte, second edition, indispensable for the poet, 70 pp.40
<i>Segiloj — Saegemwoerterbuch</i> , H. J. Plehn, English-German-Italian-Esperanto50
<i>Enciklopedia Vortaro</i> , E. Wuester, Esperanto-German, (in 4 parts: A-KOR), especially good for engineering, mathematics, chemistry, biology. Each part priced at \$3.50. All 4 parts for	14.00

Esperanto, 114 W. 16th St., New York 11, N. Y.

A WORD ABOUT THIS SPECIAL EDITION ON TECHNICAL VOCABULARIES

The importance of close international cooperation in science, technology, culture, and education, cannot be over-emphasized in this new epoch. Mechanical means having to do with speech and transportation bring men of affairs together as never before; but all too often the difficulties and limitations in language and terminology retard the progress which might otherwise be made. In matters of science and technology this is becoming ever more apparent.

The critical study and survey in this issue, by Dr. William Solzbacher, is a contribution to the solution of the problem of the standardization of terminology and nomenclature in science, technology, and other fields of human endeavor. As far as we know, it is the first major study on Technical Vocabularies in Esperanto to appear in the English language. It is the most up-to-date and, in its bibliographical part, the most complete in any language. It shows not only the immense services which Esperanto **COULD** render if it were adopted generally, but also the impressive amount of work already done in this field.

The Editor expresses the hope that this special issue of the "American Esperanto Magazine" will be of interest and practical use to many persons both outside and inside the Esperanto movement.